IMDC

International Marine and Dredging Consultants (IMDC) is an engineering and consultancy company specialized in a vast range of water related projects. Our highly qualified staff offers advice based on recent research results of leading universities and research institutes and hands-on experience acquired throughout the years.

One of IMDC's core activities is to deliver nautical assistance to our Client's projects. The wide range of services we can offer in this domain is presented in this product sheet.

More information can be found on our website: www.imdc.be

Nautical Services

Ports and waterways play a crucial role in global trade and have a significant impact on the quality of live. Worldwide, almost 90 percent of our goods are transported by sea. The success of today's global economy depends on ships and ports to move goods quickly and efficiently from producer to end user. New vessels are being deve-loped using green fuels and to transport new commodities like CO_2 and hydrogen. Furthermore, economies of scale in transportation results in increase of vessel capacity. Growth in vessel capacity and cargo volume comes with challenges for ports in terms of infrastructure and cargo handling equipment. While transport has been growing significantly during the last decades, there is also an increasing urgency to make ports and waterways more sustainable and suitable for co-use.

Oceans and seas are being more extensively used for different purposes. Examples are wind farms, fishing, aquaculture, cables and cargo transport. Due to this increasing co-use of marine areas, the risks of collisions with ships and other impacts have increased significantly over time also endangering marine ecosystems.

IMDC is offering a whole range of integrated services to support clients meeting these challenges and demands. We advise on nautical efficiency and safety in and outside ports by delivering either one dedicated service or the full range of integrated services. In all our studies we challenge ourselves to continuously search for the most sustainable solutions for our clients balancing People, Planet and Profit.

Service

Ship manoeuvring

The design of ports and marine infrastructure requires thorough knowledge of the different processes, regulations and design guidelines involved as well as practical experience. Simulators are essential when modifying or building new ports.

By carrying out fast-time and/or real-time ship maneuvering simulations we evaluate different layouts, validate and optimize our designs and ship maneuvering strategy and determine under which conditions vessels can safely enter or depart the port. We use a probabilistic approach to determine the probability of bottom contact or exceeding the channel limits. For the real-time simulations we work with pilots to account for the human factor. This is done during small sessions, but also in the form of workshops with stakeholders to make decisions with regards to safety, efficiency and other impacts.

Mooring studies

Modelling complex interactions is important to evaluate and improve efficiency and safety of marine operations. To this end IMDC uses guidelines and software models, both static and dynamic, to determine loads in the mooring system and to simulate vessel movements.

In the dynamic mooring analysis (DMA) we simulate 3-dimensional movements – translations and rotations (six degrees of freedom) - in the time-domain. We follow a digital twins approach meaning we incorporate all environmental conditions (water levels, wind, different wave fields, currents) and the mooring layout representing the real-life situation. Based on the results we optimize the port layout to provide sufficient sheltering and mooring systems to improve operability and safety.

Multi body

We are capable of assessing side by side mooring (such as LNG Carrier next to an FSRU) by carrying out a DMA study and accounting for wind, current and wave shielding effects. The results of the study are used amongst others to develop operational procedures for safe cargo transfer.

Passing ships

More and larger ships have to be accommodated in existing ports. New terminals are located along busy and narrow waterways. In these restricted waters passing ships produce suction and draw down. For vessels moored in such a waterway or adjacent harbour, the change in water draw down can result in resonant horizontal vessel motions and large loads in the mooring lines. Container cranes, loading arms for oil and LNG and automated dry bulk excavators can normally only allow limited horizontal vessel motions. Dangerous situations for crew and vessel and large down time may occur when motion limits are exceeded or when mooring lines fail. In view of the above, the RoPES (Research on Passing Effects of Ships) project was developed in a Joint Industry project. The RoPES software can be coupled to the DMA software to incorporate the forces induced by passing ships. This allows for a detailed evaluation of the effect of passing ships on moored ship operations and based on the outcome regulations can be developed (passing speed and distances) as well as improvements to the mooring system to reduce motions and forces.

Waves caused by passing ship

Marine risk, collision assessment

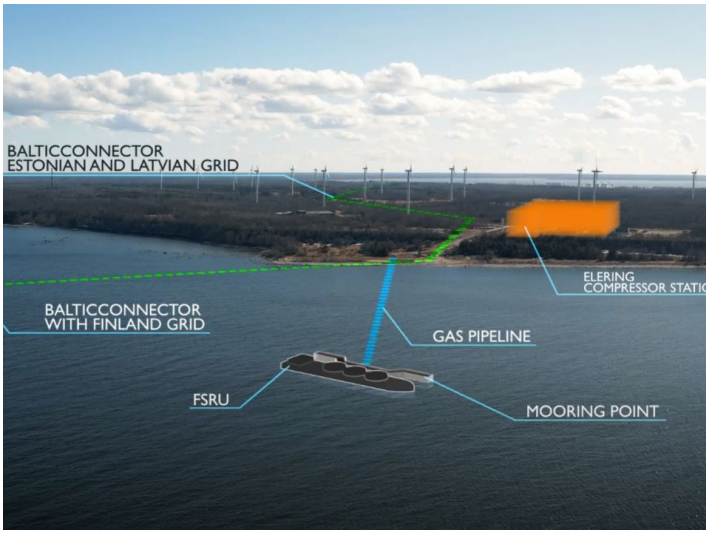
IMDC carries out marine risks assessments for marine traffic routes, pipelines and cable routes, ports, wind-farms and other objects in marine environments. We follow international guidelines like IMO for formal safety assessments. During a HAZID workshop all relevant accident scenarios with potential causes and outcomes will be listed. Hazards in unacceptable regions will be investigated in more detail with the view to identifying potential risk control options.
For quantitative risk assessments we use the IWRAP software to obtain probabilities of different type of collisions in a given waterway based on information about traffic volume/composition and route geometry.

Port and channel capacity

Generally, the capacity of a port is dependent on the dimensions of the approach area, tidal conditions, wind and wave conditions, traffic characteristics and terminal facilities. For a sound judgment of the capacity of a port simple methods as the queuing theory or linear programming are not sufficient. The marine traffic system with a complex approach system and with numerous terminals, each with its own characteristics, can only be represented as a complex system. IMDC carries out marine traffic simulations (run for one year in a fast-time simulation) to determine the capacity of the port system. The results provide insights on waiting times of arriving and departing vessels, berth occupancies, anchorage capacity and tug requirements.

Cocoli lock, Panama

Key references



Paldiski DMA multibody (2022)

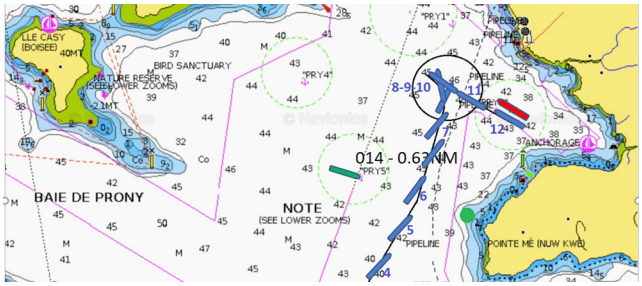
Estonia

Client: ConX PM Ltd. (Alexela)

IMDC was contracted to review the maritime design of the Paldiski FSRU project and to carry out a Dynamic Mooring Analysis to determine limiting conditions and downtime.

In the analysis the motions of the FSRU alone and with an LNGC alongside are established and related loads in the mooring system for various combinations of design and operational environmental conditions (wind, waves, water level and currents) are determined.

Sustainable Development Goals



LNG Prony Bay - nautical risk and fast-time simulations (2021)

Caledonia

Client: Prony Energies, a joint venture between Enercal and Engie

The Prony 2.0 project consisted of implementing an FSRU (Floating Storage and Regasification Unit) in Prony Bay feeding a new Gas fired Power Plant through a subsea pipeline followed by an onshore pipeline.

To evaluate the nautical safety of the project a marine traffic risk assessment was undertaken. The nautical risk study consisted of three main components:

1) Traffic analysis, to quantify the risk of collisions and allisions of passing traffic with the FSRU.
2) Qualitative risk assessment to evaluate the nautical risks.
3) Provision of risk control options

Fast-time simulations were carried out for the design LNG-carrier using the SHIPMA model. These simulations gave insight into the safety and feasibility of the manoeuvres under different environmental conditions.

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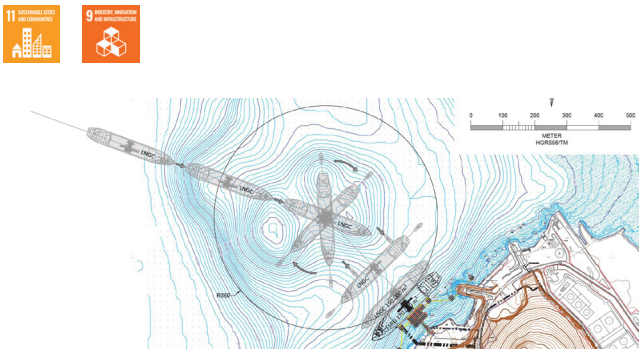

Krk LNG & FSRU FEED study (2015-2017)

Croatia

Client: LNG Croatia LLC

A FEED design for an LNG & FSRU terminal on the Croatian island of Krk was undertaken. IMDC was responsible for all the marine aspects. This included metocean data analysis, marine Basis of Design, wave and current modelling to define extreme conditions for the FEED design, defining dredging requirements, a ship approach and manoeuvring study and the design of the navigation channel and turning circle.

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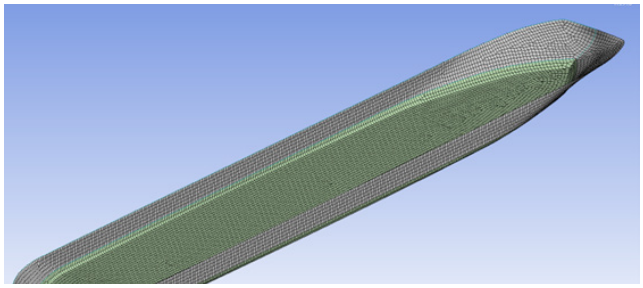

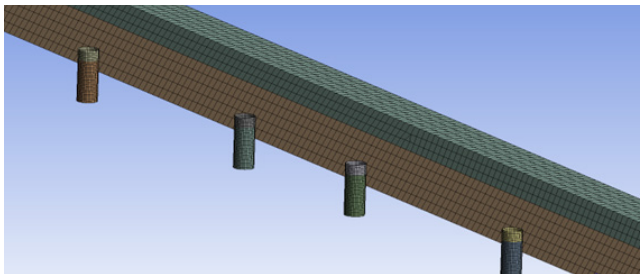

Passing ship study Chevron Jetty Ghent (2018)

Belgium

Client: Besix

A dynamic mooring analysis was carried out for the Chevron jetty along the Ringvaart in Ghent. During the study the effect of passing ships under different environmental conditions was investigated.

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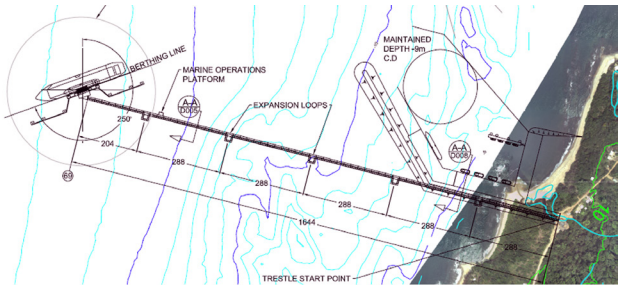

Cameroon LNG Pre-FEED (2009-2015)

Cameroon

Client: Engie

In 2009, GDF Suez started to investigate various scenarios for a network of gas transport pipelines offshore of Cameroon to inter-connect different production areas and then transport the gas to shore. One of the options was to return the gas to an offshore LNG plant where the natural gas was then going to be liquefied. IMDC prepared a pre-feasibility study and provided expert advice and technical services on all topics related to maritime and nautical aspects e.g. port layout optimisation, design of coastal and bottom protection, hydrodynamic modelling, sediment and plume modelling, nautical design, metocean measurements (including technical specifications and follow up of long term measurements executed).

Sustainable Development Goals